Encyclopædists (it is difficult to imagine them to be anything else than youthful, no matter how many years they may have lived), will hold themselves in check until they learn something that other people do not know, or until they learn what other people do know so well and so clearly that they can claim some right to classify, edit and arrange existing knowledge, they will *confer a favor upon themselves* the magnitude of which it is difficult to estimate.

Alternating Electric Currents. By EDWIN J. HOUSTON and A. S. KENNELLY. New York, The W. J. Johnston Co. Pp. 225. Price $1.

This little volume forms one of the "Electro-Technical Series," of which nearly a dozen volumes have been prepared by Messrs. Houston and Kennelly. It treats of one of the most important and most prominent departments of applied electricity. The development of the theory of Alternating Currents and their practical utilization is of comparatively recent date. The large pecuniary interests involved in the various processes by which energy is transformed have put a premium upon the exploration and exploitation of this branch of physical science such as no other has ever felt. Workers in science generally are sustained by that motive and inspiration which compels the practical geographer to force his way into and through unknown regions, his reward being the knowledge of their nature and inhabitants, with which he is laden when he returns. In electricity there is the additional powerful incentive that gems and precious metals are tolerably sure to be met with. The science of electricity has prospered, therefore, during the last decade in a manner only equaled or excelled by its practical applications. Even the expert now finds it difficult to keep thoroughly informed of the rapid and often far-reaching advances that are continually being made. To the layman, or even to the general physicist, who has not been forced as, alas! nearly all have, to 'specialize' in electricity, any book which summarizes this progress in an intelligent and scientifically correct manner will be welcome. To such this book will be of much use. The conception of the alternating current is well worked out in the first chapter, and in those following its application to the transmission of power and to electric lighting is discussed in a popular readable form, including a discussion of diphase, triphase and monocyclic currents and transmission. The principle criticism that may be applied to the book is the unnecessary presentation of a great deal of elementary matter, concerning which the reader is almost sure to be already well informed. It does not seem likely that any one who undertakes to read a book, be it ever so simple, on 'Alternating Electric Currents' will be entirely ignorant of a simple primary battery, of the form of an electric magnet, of the appearance and construction of an incandescent lamp, of which there is a long and elaborate description. The amount of ignorance which is here assumed is not quite in harmony with the amount of technical information which the reader must possess in order to understand other portions of the book. The volume could have been made more valuable by assuming on the part of the reader that knowledge of direct current electricity which he is tolerably certain to possess or which he can readily obtain from other volumes of the same series. There are certain advantages, it is true, in having each volume complete in itself, but these are greatly exceeded by the disadvantages growing out of the enforced buying, owning and reading the same matter over and over again.

THE MAGNETIC RESURVEY OF AUSTRIA AND HUNGARY.

FROM a recent report* by Dr. Liznar, of the 'Central Anstalt für Meteorologie und Erdmagnetismus' of Vienna, we find that the recent magnetic resurvey of Austria and Hungary (1889–'93) has been brought to a termination. An earlier magnetic survey had already been made by Karl Kreil between the years 1843 and 1858, which was repeated a few years later,

*J. Liznar: Die Vertheilung der erdmagnetischen Kraft in Österreich-Ungarn zur Epoche 1890.0 nach den in den Yahren 1889 bis 1894 ausgeführten Messungen. 1 Theil, Erdmagnetische Messungen in Österreich ausgeführt auf Kosten d. Kais. Akad. d. Wiss. in d. Y. 1889–'93, von. J. Liznar. Wien, 1895, 4°, 232 pp. Repr. Denk. d. Wiener Akad. Math. naturw. Cl. Bd. LXII.

as far as Hungary was concerned, by Guido Schenzl. On account of the slow, so-called *secular changes*, whereby the distribution of terrestrial magnetism is forever changing its present aspect, it becomes essential to repeat such surveys from time to time. We are thus enabled to follow empirically, at least, the modus operandi of that occult, elusive force—the cause of the secular variation of terrestrial magnetism.

Other reasons make it desirable to repeat and amplify former surveys. Not only are our present methods of observations more refined, but experience has repeatedly taught that a magnetic chart based upon a few isolated observations gives but a very crude picture of the actual distribution of magnetism within the earth's crust. The complexity of the picture or the irregularity of the representative distribution curves furnishes, generally speaking, the truest index of the thoroughness of the underlying survey.

The first part of the report before us, of which the second is to appear later, is devoted to the publication and reduction of the observations made in Austria by Dr. Liznar, under the auspices of the Vienna Academy of Sciences. On pp. 230 and 231 is given in alphabetical order the 109 observation stations, together with their geographical positions and the observed magnetic elements reduced to the epoch 1890.0. The intensities (horizontal and total) are given to four decimals in mm. mg. s. units—a simple division by 10 will reduce to c. g. s. units.

The discussion of the results and the delineation by charts of the magnetic distribution are reserved for the second part, which is also to contain the observations made by previous agreement during the same time interval along the Adriatic coast by the Hydrographic office of Pola, and in Hungary by the Central Meteorological and Magnetic Institute of Budapest. Great care was taken that observations thus made under different auspices should be strictly comparable. Frequent inter-comparisions of the instruments used were made by selecting common observing stations, as also were the instruments compared with those at the Central Institute.

Two points are suggested by this report, the first of which may perhaps appear trivial, but from which we, nevertheless, might draw a useful lesson. This report, like many others of a scientific character, received from abroad is above all *well printed*, a fact which is not characteristic of some of our scientific government publications, whose typographical execution in several notable instances has been abominable. We believe that what is worth doing at all is not alone worth doing well, but also *printing well*. Too often the character of the contents is judged by the external appearance.

The second point suggested is the great desirability of a detailed magnetic survey of our own confines. Our Coast and Geodetic Survey is doing excellent work in this direction, but the comparatively few observations, if you consider the territorial extent involved, it can make with all its manifold other duties, are wholly inadequate for a fairly accurate representation of terrestrial magnetic distribution in the United States. How fraught with problems of the most interesting and suggestive character a *detailed* magnetic survey can present to the physicist and to the geologist has been clearly shown by the Rücker and Thorpe minute magnetic survey of Great Britain.

At the present time when many of the European governments have either just carried out detailed surveys or are about to do so, it behooves us to fall in line. But *one* State of the Union has received the distinction of having a fairly complete magnetic survey made of it, and this was due to the *private* enterprise and enthusiasm of Prof. Francis E. Nipher, of Washington University, St. Louis. Good work has also been accomplished in this direction by the geologists in New York, New Jersey and Pennsylvania. It is firmly believed that more of such detail work will redound to the benefit of geology and of geomagnetism.

L. A. B.

Tables for the Determination of Common Minerals. By PROF. W. O. CROSBY, of the Mass. Inst. of Technology.

This book, the third edition of which has just been published (1895), is a very carefully prepared scheme for the determination of about two hundred and twenty-five of the more com-

mon mineral species, chiefly by means of their physical properties with confirmatory chemical tests. A special feature is the addition of a supplemental table for the determination of one hundred of the rarer minerals, thus avoiding for the student the unnecessary use of a large cumbersome scheme, and at the same time reducing to a minimum the chances of meeting a mineral not contained in the Tables.

The general idea of the scheme is to make two grand divisions into the minerals *with* and the minerals *without metallic lustre*. The minerals having *metallic lustre* being further sub-divided into groups by their *color* and approximate *hardness*. The minerals with *non-metallic lustre* being grouped by color of *streak*, approximate *hardness*, *specific gravity* and general structure.

These Tables carry out the idea that a scheme is the *better*, the more closely it tends to facilitate recognition of minerals at sight by their structural and physical characters. For this reason chemical tests are only used as confirmatory and are made as simple as possible, so as to put them within the reach of persons having only a blowpipe outfit. Schemes of this character can be used with great success by students who are more or less proficient in mineralogy, and who have been carefully trained in observation. One part of the scheme that might give trouble to beginners is the required determination of the specific gravity of the non-metallic minerals. A determination for which special apparatus is needed and which is generally more or less difficult. Schemes for the non-metallic minerals based on fusibility and solubility, especially when dealing with massive minerals, may give more general satisfaction when used by beginners.

The introductory part includes a detailed description of the morphological, physical and chemical properties of minerals, and a short explanation of the blowpipe tests made use of in the Tables. A simple and inexpensive form of specific gravity apparatus is also described. A list is furnished the student of fifty of the common minerals, giving very characteristic tests and most useful in commencing a course of determinative mineralogy.

A very convenient chapter is that on 'How to use the Tables.' Here the structural, physical and chemical properties of several minerals are given, and the student is taken, step by step, by reference to page, etc., through the actual determination or confirmation of the mineral. A great advantage in this scheme is having the general synopsis all contained on one page, after reference to which it is generally possible to turn immediately to the part of the Tables needed for the determination of the special mineral in question.

The separation of the scale of hardness into five divisions instead of ten also has its advantages, as it makes possible the use of the Tables when only an approximate determination of the hardness has been made.

After each mineral species in the Tables a number, in parenthesis, is given, which refers to the synopsis of classification where at a glance the general relation of the special mineral to the rest of the mineral kingdom is given.

At the end of the Tables a very convenient index of mineral names and synonyms is found.

LEA MCI. LUQUER.

Fauna fosil de la Sierra de Catorce, en San Luis Potosi. AGUILERA Y DEL CASTILLO. Boletin de la Comision Geologica de Mexico. No. 1, Mexico. 1895. Pp. 55, plates xxiv.

In this publication, the authors confirm the existence of the Jurassic System in Mexico. They note that the formation has a vast extent, greater than is commonly believed, partly for the reason that the localities are widely separated and difficult of access. The fossils also are scarce and not well preserved. Another circumstance which appears to be unfavorable to the recognition of the system is its gradual passage into the overlying Cretaceous. This transition zone is barren of fossils or at best contains forms which are of difficult interpretation. The Jurassic rocks belong mostly to the upper division, but localities exist in which strata are found representing the middle and lower members. Some authors, deceived by the resemblance of the Cretaceous limestones to those of the Jura, have referred these deposits to the Jurassic, but our authors have referred them on the evidence of their contained fossils to the Cretaceous on the geological map of the Republic.

The Jurassic fauna consists largely of species apparently peculiar to Mexico. It is characterized by numerous forms of Aucella and Perisphinctes, about half of which are described as new species. This paper, following so soon after the discoveries of Diller and Hyatt in California, is of much interest to American geologists.

The authors have been unfortunate in the hands of their lithographer. The plates are of little use; some of the figures are scarcely recognizable.

J. B. Woodworth.

An Introduction to General Biology. Sedgwick and Wilson. Second Edition. 1895. New York, Henry Holt & Co.

The original Practical Biology of Huxley and Martin, written in 1875, has stimulated the production of a large growth of text-books and laboratory manuals. Huxley and Martin attempted to present the fundamental facts of biology to the student by the study of a series of typical animals and plants, beginning with the simplest and ending with the more complex. Nevertheless, this logical method proved impractical and in a later and too-much enlarged edition the authors (or rather their successors, with Huxley's approval) reversed the order of treatment of the subject. The higher forms were first studied and then the student was led down through a series of simpler forms. Huxley said, however admirable the first method followed by him had been 'it had its defects in practice.'

Sedgwick and Wilson adopted, in 1886, a third order of procedure in the first edition of their General Biology. Two common forms, the fern and the earthworm, were first thoroughly described as introductory to a later study of other animals and plants; and a second volume was promised, dealing with the other forms. This second part has never appeared and its publication has been finally abandoned.

A *second edition* of the General Biology of Sedgwick and Wilson has just come out and will be welcomed by all those who have learned through experience the great value of the first edition.

In the present edition the principal changes are as follows: (1) The book has been enlarged so as to include a series of unicellular forms (Amœba, Infusoria, Protococcus, Yeasts, Bacteria). (2) The laboratory directions given in the first edition have been omitted. In their place an admirable appendix has been added. The appendix describes the best methods in preserving and preparing the forms described in the text; a large number of valuable and practical suggestions are also added. (3) The order of presentation has been reversed. The earthworm now comes first and then the fern follows.

In the first edition, and in the present edition also, the student is introduced to the subject of General Biology by a chapter dealing with the differences between living and lifeless things, 'believing that Biology should follow the example of Physics and Chemistry in discussing at the outset the fundamental properties of matter and energy.' If we consider, however, the unsettled state of mind of biologists at present on these fundamental questions and, further, the presumed ignorance of the student of all knowledge of living things we cannot but think this method of presentation open to question.

The next two chapters in the present edition, following the order of the first edition, deal with a study of a series of heterogeneous objects illustrating 'the structure of living things' and 'protoplasm and the cell.' The *pièce de resistance* is then introduced.

The reason assigned by the authors for offering first the earthworm 'lies in the greater ease with which the physiology of an animal can be approached.' However true this may be from the student's standpoint, it presents certain difficulties to the concientious teacher, for in reality very little physiology is actually known for the earthworm, 'save by analogy with higher animals.'

For ourselves, we prefer *at present* the old sequence with the plant first and the animal later, admitting wide scope for individual taste. Practically, we have found that the new edition adapts itself to our own idiosyncrasies and works backward just as well as forward.

Most important additions and corrections have been made to the description of the structure of the earthworm. The accounts of the circulatory and nephrideal systems have been

extended. The former imperfect description of the male reproductive organs has been corrected. The histology of the nervous system is more fully described and the results brought up to date according to Retzius and Lenhossék.

The description of the development of the earthworm from the egg is more fully given, and a description of the internal phenomena of cell-division is added.

The process of regeneration in the earthworm is incorrectly, or at least very imperfectly, described. "The earthworm is not known to multiply by any natural process of agamogenesis. It possesses in a high degree, however, the closely related power of regeneration; for if a worm be cut transversely into two pieces the anterior piece will usually make good or regenerate the missing portion, while the posterior piece may regenerate the anterior region" (page 73). Rarely or never will this happen in the earthworm! If the anterior piece be sufficiently long, *i. e.*, if it contains more than 24 segments it may then regenerate posteriorly. But the corresponding posterior end will not under these conditions regenerate. A shorter anterior piece will not regenerate. A posterior piece having lost less than 15 anterior segments may regenerate and replace all or part of those lost.

Few and unimportant changes seem to have been added to the description of the structure and physiology of the fern.

The brief descriptions of the unicellular forms are most admirable and a most important addition has been made to the older volume. A statement in the chapter devoted to yeast calls for correction (page 188). "It was supposed for a long time by Pasteur and others that yeast could dispense with free oxygen in its dietary. It now appears that this faculty is temporary only." * * * Pasteur himself on the contrary has given the results of a most elaborate series of experiments to demonstrate that yeast *can not permanently* dispense with free oxygen in its dietary.

Chapter XVI on bacteria and Chapter XVII on 'a hay infusion' give in few words a thoroughly good summary of the part played by bacteria in the world's economy.

The first edition of the General Biology filled a unique place amongst our text-books and the new edition fulfills all the uses of the first edition. It brings the latter down to date and we venture to prophesy that it will meet with a hearty reception. The volume is a much-needed and most valuable addition to our best text-books. It is well printed and illustrated, and the descriptions of the authors are always clear and concise. T. H. MORGAN.

SCIENTIFIC JOURNALS.

AMERICAN CHEMICAL JOURNAL, NOVEMBER.

JACKSON and Grindley contribute further results of their work on the action of sodic alcoholates on chloranil. They describe the methods of preparation, properties and reactions of a number of acetals derived from substituted quinones.

Orndorff and Cameron find that the substance formed by the action of sunlight on anthracene in benzene, is dianthracene and not a paranthracene. They obtained the substance in pure condition and made a thorough crystallographic study of it. Interesting points of resemblance and difference were brought out by a comparison of the measurements of the axial ratios and angles. All attempts to bring about the transformation by any other method than that made use of failed.

Hitherto all the determinations of the molecular weight of paranthracene have been made by the freezing-point method. The vapor-density method could not be used, as paranthracene is converted into anthracene at its melting point (244°). The results obtained by the freezing-point method varied greatly, and were very unsatisfactory, on account of the slight solubility of the substance in all the solvents used. The authors find that, by the use of the boiling-point method, using pyridine, anisol and phenetol as solvents, good results can be obtained.

Campbell has prepared copper oxide containing a small amount of palladium, and finds that the combustion of gases takes place at a lower temperature when he uses this mixture than when the oxygen is introduced in the form of gas.

Kastle suggests the use of the dichlor deriva-